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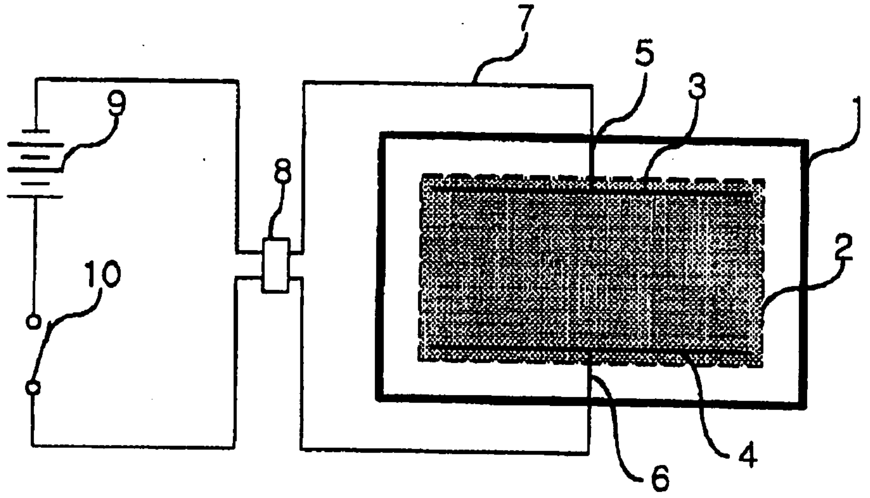
(54) ANTI-FROST GOGGLES AND METHOD FOR MANUFACTURING THE SAME



(57) Disclosed are anti-frost goggles and a method for manufacturing the same. The method involves the steps of thermally shrinking a thermoplastic resin film, sputtering a tin oxide on the thermoplastic resin film at a plurality of separate parallel regions, thereby forming heating elements on the thermoplastic resin film at the regions, respectively, forming electrodes in pair on the heating elements using a negative masking printing process, plating, on the thermoplastic resin film, a pair of power supply lines each connected to associated one of the electrodes formed on each of the heating elements while having a desired thickness, using a negative masking printing process, forming a transparent coating over the resulting structure obtained after the plating of the power supply lines, using a spray coating process, cogging power terminals to the thermoplastic resin film at regions where respective ends of the power supply lines opposite to the electrodes are arranged, forming PTC thermistors on a selected one of the power supply lines at regions where the selected power supply line is connected to the associated electrodes, respectively; and cutting the thermoplastic resin film to hare a desired shape, and conducting a resistance test for the resulting structure obtained after the cutting of the thermoplastic resin film.

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ABSTRACT OF THE DISCLOSURE

Disclosed are anti-frost goggles and a method for manufacturing the same. The method involves the steps of thermally shrinking a thermoplastic resin film, sputtering a tin oxide on the thermoplastic resin film at a plurality of separate parallel regions, thereby forming heating elements on the thermoplastic resin film at the regions, respectively, forming electrodes in pair on the heating elements using a negative masking printing process, plating, on the thermoplastic resin film, a pair of power supply lines each connected to associated one of the electrodes formed on each of the heating elements while having a desired thickness, using a negative masking printing process, forming a transparent coating over the resulting structure obtained after the plating of the power supply lines, using a spray coating process, cogging power terminals to the thermoplastic resin film at regions where respective ends of the power supply lines opposite to the electrodes are arranged, forming PTC thermistors on a selected one of the power supply lines at regions where the selected power supply line is connected to the associated electrodes, respectively; and cutting the thermoplastic resin film to have a desired shape, and conducting a resistance test for the resulting structure obtained after the cutting of the thermoplastic resin film.

ANTI-FROST GOGGLES AND METHOD FOR MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to anti-frost goggles and a method for manufacturing the same, and more particularly to a method for manufacturing anti-frost goggles, such as protective goggles attached to a face protection helmet for snow mobiles or motorcycles or protective goggles for skiing or skating, capable of preventing an accumulation of frost on the goggles due to the wearer's breath or moisture when the ambient temperature is low.

Description of the Related Art

There are a variety of protective goggles adapted to protect a part of the wearer's body, the face, or the eyes from wind or foreign matters. In particular, diverse protective goggles have been proposed for various purposes. Generally, such protective goggles include protective goggles attached to the front face of a helmet for protecting the wearer's head, such as a helmet for snow mobiles or motorcycles, and protective goggles fittable over the eyes of a wearer to protect the wearer's eyes.

Such protective goggles have a problem in that they may be steamed up or accumulated with frost at the outer or inner surfaces thereof due to a temperature difference between the temperature of a goggle interior defined in a worn state of the protective goggles and the ambient temperature. That is, where the protective goggles are used under the condition in which the ambient atmosphere is considerably moist and relatively lower than the goggle interior, it is steamed up. On the other hand, where the protective goggles are used under the condition in which the ambient atmosphere is considerably moist and considerably lower than the goggle interior, it is accumulated with frost. In particular, in the case of protective goggles for skiing or skating, the wearer cannot see the front view when the ambient temperature is relatively low because the protective goggles are not only steamed up by wearer's breath at the inner surfaces thereof, but also accumulated with frost at the outer surfaces thereof.

In order to solve such problems, anti-frost protective goggles have been proposed. An example of conventional anti-frost protective goggles is illustrated in Fig. 1. Referring to Fig. 1, a heating element 2 is provided at the inner surface of a goggle body 1. A pair of electrodes 3 and 4 are also provided at the inner surface of the goggle body 1 at upper and lower portions of a goggle body 1, respectively. The electrodes 3 and 4 are electrically connected to upper and lower ends of the heating element 2 to generate a resistance heat at the heating element 2. A power supply means 9 is electrically connected between the electrodes 3 and 4 via power supply lines 5 and 6. A terminal 8 is connected between the power supply means 9 and the power supply lines 5 and 6 via external electric wires 7. A power switch 10 is coupled between the terminal 8 and the power supply means 9.

The heating element 2 is formed by silk-printing an indium tin oxide (ITO) in accordance with an ITO treatment. The electrodes 3 and 4 are formed by printing silver lines. The heating element 2 has a full resistance of 9 to 9.5 Ω while exhibiting a residual resistance of about 3 Ω due to the silk printing thereof. The power supply means 9 is adapted to supply a DC voltage of 12 to 13.6 V.

When the anti-frost protective goggles worn by the wearer are accumulated with frost, the wearer switches on the power switch 10. At the ON state of the power switch 10, a voltage is applied to the electrodes 3 and 4 via the terminal 8 and the power supply lines 5 and 6, so that the heating element 2 generates heat by the applied voltage. Thus, the frost accumulated on the goggle body 1 is removed by the heat generated from the heating element 2. That is, the heating element 2 has a resistance for changing electrical energy into thermal energy, thereby defrosting the goggle body 1.

However, the above mentioned anti-frost protective goggles have a problem in that the heat generated from the heating element cannot be uniformly distributed over the entire portion of the goggles because the electrodes are printed in the form of two silver lines at the upper and lower ends of the goggle body. Furthermore, it is difficult to remove frost accumulated on left and right surfaces of the goggle body. Also, the thickness of each electrode is exposed to a view region of the goggle body, so that it may obstruct the wearer's field of vision and spoil the beauty of the protective goggles.

The electrodes have a simple arrangement in that they are formed at the upper and lower ends of the goggle body or the left and right end of the goggle body. Where the wearer does not switch off the power switch after the protective goggles are completely defrosted, film portions of the goggle body corresponding to the electrodes may be shrunk due to strong heat continuously generated. In severe cases, the protective goggles may be used no longer. Thus, the conventional anti-frost protective goggles have problems of a degradation in the anti-frost protection function and a degradation in reliability.

In the above mentioned conventional anti-frost protective goggles, the film of the goggle body may be deformed due to heat because the heating element consists of combined resistances having different spacings, and it is formed without being subjected to an aging treatment. Furthermore, an ITO treatment using expensive indium is conducted to form the heating element. Moreover, no coating treatment is conducted after the ITO treatment. For this reason, the resultant heating element exhibits a degraded durability. In particular, there is a problem in that the goggle body may be deformed when the heat generated from the heating element is 50 °C or more.

SUMMARY OF THE INVENTION

Therefore, a first object of the invention is to provide a method for manufacturing anti-frost protective goggles, which is capable of preventing a deformation of the goggles even at an increased temperature of heat generated from a heating element and preventing a generation of heat of an excessively high temperature while allowing the heating element to generate heat uniformly distributed throughout the entire portion of a goggle body by forming the heating element using a tin oxide to have heating element areas arranged in parallel to one another, forming electrodes in accordance with a masking printing process, intentionally thermally shrinking a film forming the goggle body, at a desired temperature for a desired period of time, and conducting a PCT treatment for the heating element, and capable of allowing the goggles to an elegant appearance by reducing the thickness of each electrode to avoid the electrodes from being exposed to a view region of the goggle body, and directly soldering power supply terminals to the goggle body.

A second object of the invention is to provide anti-frost protective goggles manufactured in accordance with the above mentioned method accomplishing the first object of the invention.

In accordance with one aspect, the present invention provides a method for manufacturing anti-frost goggles, comprising the steps of: preparing a thermoplastic resin film; thermally shrinking the thermoplastic resin film at a desired temperature for a desired period of time; sputtering a tin oxide on the thermoplastic resin film at a plurality of separate parallel regions, thereby forming heating elements on the thermoplastic resin film at the regions, respectively; forming electrodes in pair on the heating elements using a negative masking printing process; plating, on the thermoplastic resin film, a pair of power supply lines each connected to associated one of the electrodes formed on each of the heating elements while having a desired thickness, using a negative masking printing process; forming a transparent coating over the resulting structure obtained after the plating of the power supply lines, using a spray coating process; cogging power terminals to the thermoplastic resin film at regions where respective ends of the power supply lines opposite to the electrodes are arranged; forming PTC thermistors on a selected one of the power supply lines at regions where the selected power supply line is connected to the associated electrodes, respectively; and cutting the thermoplastic resin film to have a desired shape, and conducting a resistance test for the resulting structure obtained after the cutting of the thermoplastic resin film.

In accordance with another aspect, the present invention provides anti-frost goggles comprising power supply means for supplying a voltage of a desired level, a power switch for switching on and off the voltage supplied from the power supply means, and an electric line adapted to electrically connect the power supply means and the power switch in series, further comprising: heating elements arranged together in parallel on a body of the goggles while being uniformly spaced apart from one another by a desired distance; a plurality of electrodes arranged in pair on a body of the goggles, the electrodes of each of the electrode pairs being electrically connected to opposite ends of an associated one of the heating elements, respectively; power supply lines adapted to electrically connect the electrode pairs in parallel; PTC thermistors each adapted to switch on and off the voltage applied to an associated one of the heating elements via the power supply lines, in accordance with a temperature of the associated heating element; and terminals respectively soldered to portions of the goggle body, where respective ends of the power supply lines opposite to the electrodes are arranged, each of the terminals being electrically connected to an associated end of the electric line and an associated one of the ends of the power supply lines opposite to the electrodes.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

Fig. 1 is a schematic view illustrating the configuration of conventional anti-frost protective goggles;

Fig. 2 is a schematic view illustrating the configuration of anti-frost protective goggles according to the present invention; and

Fig. 3 is a flow chart illustrating a method for manufacturing the above mentioned anti-frost protective goggles in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, the present invention will be described in detail, with reference to the annexed drawings.

Fig. 2 is a schematic view illustrating the configuration of anti-frost protective goggles according to the present invention.

The anti-frost protective goggles includes a goggle body 100. This goggle body 100 is made of a thermoplastic resin film. This thermoplastic resin film may include a polyethylene terephthalate (PET) resin film, a polycarbonate (PC) resin film, a tricarbonate resin (TC) film, a cellulose propionate resin (CP) film, or a cellulose acetate (CA) resin film.

A plurality of heating elements 102 are formed on the thermoplastic resin film forming the goggle body 100. The formation of the heating elements 102 is carried out by sputtering a tin oxide on the thermoplastic resin film at a plurality of separate regions each having a minimum or unit area allowing heat generated at an associated one of the heating elements 102 to be uniformly distributed throughout that area. A pair of electrodes 103 and 104 are formed on each heating element 102 so as to apply a supply voltage across the heating element 102. Power supply lines 105 and 115 are respectively connected to the electrodes 103 and 104. The power supply lines 105 and 115 are formed in accordance with a masking printing process involving a processing step of peeling off desired portions of the electrodes 103 and 104 respectively corresponding to those power supply lines 105 and 115. The electrodes 103 and 104 are arranged in pair at opposite ends of the goggle body 100 facing each other in a desired direction, preferably, a longitudinal or vertical direction. These electrode pairs correspond to respective heating elements 102. The spacing between the electrodes 103 and 104 of each electrode pair may be different from those of the remaining electrode pairs, depending on the shape of the goggle body 100. Alternatively, the electrodes 103 and 104 may be arranged in pair at opposite lateral ends of respective heating elements 102.

The heating elements 102 are arranged in parallel to each other in the lateral direction of the goggle body 100 while being spaced apart from one another by a uniform distance. The heating elements 102 are electrically connected in parallel to one another between the electrodes 103 and 104. A PTC thermistor 110 is formed at each heating element 102 in order to prevent the heating element 102 from generating heat of a temperature higher than a predetermined temperature. Terminals 107 are electrically connected to the electrodes 103 and 104 via power supply lines 115 and 105, respectively, so as to electrically connect the heating elements 102 to a power supply means 108 in parallel. The terminals 107 are directly soldered to the goggle body 100 without using any electric wire. The poser supply means 108 is adapted to supply a voltage of a desired level. A power switch 109 is coupled between the terminals 107 and the power supply means 108 via power supply lines 106. The PCT thermistor 110 of each heating element 102 serves to switch on and off the voltage supplied via the power supply line 115 in accordance with the temperature of the heating element 102. That is, the PCT thermistor 110 cuts off the supply of the voltage to the power supply line 115 when the temperature of the heating element 102 increases to a temperature higher than the predetermined temperature, while allowing the voltage to be applied to the power supply line 115 when the temperature of the heating element 102 is reduced to the predetermined temperature or below.

The power supply lines 105 and 115 electrically connects the electrodes 103 and 104 of the heating elements 102 in parallel while electrically connecting them to positive (+) and negative (-) poles of the power supply means 108, respectively.

Fig. 3 is a flow chart illustrating a method for manufacturing the above mentioned anti-frost protective goggles in accordance with the present invention. In accordance with this method, a resin film is first prepared for the goggle body 100 at step S10. For the resin film, a PET film may be preferably used. The prepared resin film is then subjected to a thermal shrinkage process, for example, an aging process, at a desired temperature of, for example, 100 °C, for a desired period of time, for example, 4 hours. The thermal shrinkage process is adapted to prevent a thermal deformation of the resin film.

Thereafter, a tin oxide is sputtered on a surface of the resin film at step S11, in order to form the heating elements

102 at separate regions each having a desired area, respectively. The area of each heating element 102 is determined to allow heat generated at the heating element 102 to be uniformly distributed throughout that area. The area of each heating element 102 may be experimentally determined. Preferably, the sputtering process is carried out on the regions of the resin film in a parallel fashion so that the heating elements 102 respectively formed at the those regions exhibit the same resistance.

At step S12, an electrode film such as a silver film is formed on the sputtered thin oxide film at opposite ends of each sputtered region, and a mask is then formed on the electrode film in accordance with a masking printing process, respectively, in order to form the electrodes 103 and 104. The masking printing process is conducted in a negative fashion.

At step S13, portions of the electrode film arranged at regions other than regions respectively corresponding to the electrodes 103 and 104 are etched using an etchant. The mask is then peeled off at step S14. Thus, the electrodes 103 and 104 are formed.

Subsequently, a mask is formed in a negative fashion on the resin film at a desired region at step S15, to form power supply lines 105 and 115. A conductive layer is then plated to a desired thickness on the masked resin film at step S16. Preferably, the plated conductive layer is made of copper, nickel, or an alloy thereof. Thereafter, the portion of the conductive layer arranged on the mask region is peeled off. Thus, the electrodes 103 and 104 are formed. A transparent coating is formed over the resulting structure in accordance with a spray coating process at step S18. The transparent coating may be made of PET or acrylic resin.

At step S19, a cogging process involving a soldering process is then conducted to connect the terminals 107 to the thin film. The terminals 107 are also connected to the power supply means 108 via the power supply lines 106. Then, the PCT thermistors 110 are formed, which serve to prevent the goggle body 100 from being increased in temperature up to a temperature of, for example, 80 °C, due to heat generated from the heating elements 102, thereby protecting the goggle body 100. Each PTC thermistor 110 is increased in zero load resistance as the ambient temperature increases. The current-voltage characteristics of the PTC thermistor 110 are represented by a relation between a voltage applied between the terminals of the PTC thermistor at a specified temperature in still air and a current (DC current or AC current of 40 to 60 Hz) measured after a temperature equilibrium is established. The maximum voltage of the PCT thermistor 110 is a DC voltage applicable to the PTC thermistor in a continued fashion after a switching of the PTC thermistor at the normal ambient temperature in still air.

After the complete fabrication of all elements on the resin film, as mentioned above, the resin film is cut to have a desired shape corresponding to the shape of the goggle body 100. Thereafter, a resistance test is conducted for the resultant product in order to determine whether or not that product exhibits a desired resistance of, for example, about 9 Ω. Thus, the manufacture of the anti-frost protective goggles is completed.

In accordance with the characteristics of the anti-frost protective goggles according to the present invention, a DC voltage of 12 to 13.6 V is used for the supply voltage. Also, a battery (dry battery or chargeable cell) is used for the power supply means 108. The protective goggles exhibits a full resistance ranging from 9 Ω to 9.5 Ω while exhibiting a residual resistance of 0 Ω by virtue of the plating treatment. Since the heating elements 102 are electrically connected together in parallel, they have the same resistance. In other words, heat generated from the heating elements 102 are uniformly distributed throughout the entire portion of the protective goggles. Since the resin film is treated by an aging process involving a thermal shrinkage of that resin film, there is no or little deformation resulting from heat. The heating elements 102 are formed in accordance with a sputtering process in an appropriate atmosphere, for example, an O_2 atmosphere, using a tin oxide without using an expensive indium.

Accordingly, it is possible to reduce the manufacturing costs while obtaining a superior durability. Since the PTC thermistors 110 are provided at respective heating elements 102, it is also possible to prevent the protective goggles from being overheated. As mentioned above, the terminals 107 are soldered to the goggle body 100, thereby allowing the protective goggles to have an elegant appearance. The goggle body 100 may also be subjected to an anti-fog treatment at its inner surface facing to the wearer's eyes in order to prevent the inner surface of the goggle body 100 from being steamed up by the wearer's breath.

Alternatively, the heating elements 102 may be formed using an indium tin oxide. This may be implement where it is required to manufacture high-priced anti-frost protective goggles.

The anti-frost protective goggles can be widely applied to helmets for skiing, skating, driving of cars, airplanes, ships, and snow mobiles, glasses, or industrial goggles.

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

As apparent from the above description, the present invention provides anti-frost protective goggles manufactured by subjecting a thermoplastic resin film to a thermal treatment, forming heating elements in accordance with a tin oxide sputtering process, forming electrodes in accordance with a masking printing process, forming power supply lines in accordance with a plating process, and forming PCT thermistors for preventing an overheating of the heating elements. In accordance with the present invention, the manufacturing costs are reduced by virtue of the use of tin oxide. Since the heating elements and electrodes are uniformly arranged in a parallel fashion, the protective goggles are uniformly heated throughout the entire portion thereof. Accordingly, it is possible to avoid the protective goggles from being shrunk. Since terminals serving to electrically connect the electrodes to a power supply means are directly soldered to the thermoplastic resin film, and the electrodes are formed in accordance with a plating process, those terminals and electrodes do not obstruct the wearer's field of vision, and provide an elegant appearance. In addition, there are an improvement in the processability required in the manufacture of the protective goggles, an increased applicability, and a superior performance of the protective goggles.

WHAT IS CLAIMED IS:

1. A method for manufacturing anti-frost goggles, comprising the steps of:

preparing a thermoplastic resin film;

thermally shrinking the thermoplastic resin film at a desired temperature for a desired period of time;

sputtering a tin oxide on the thermoplastic resin film at a plurality of separate parallel regions, thereby forming heating elements on the thermoplastic resin film at the regions, respectively;

forming electrodes in pair on the heating elements using a negative masking printing process;

plating, on the thermoplastic resin film, a pair of power supply lines each connected to associated one of the electrodes formed on each of the heating elements while having a desired thickness, using a negative masking printing process;

forming a transparent coating over the resulting structure obtained after the plating of the power supply lines, using a spray coating process;

cogging power terminals to the thermoplastic resin film at regions where respective ends of the power supply lines opposite to the electrodes are arranged;

forming PTC thermistors on a selected one of the power supply lines at regions where the selected power supply line is connected to the associated electrodes, respectively; and cutting the thermoplastic resin film to have a desired shape, and conducting a resistance test for the resulting structure obtained after the cutting of the thermoplastic resin film.

2. The method according to claim 1, wherein each of the heating element has a minimum area allowing heat generated from the heating element to be uniformly distributed throughout the area.

3. The method according to claim 1, wherein the step of forming the electrodes comprises the steps of:

forming an electrode layer on the heating elements;

printing a negative mask on the electrode layer;

etching exposed portions of the electrode layer not covered with the negative mask; and

peeling off the negative mask.

4. The method according to claim 1, wherein the step of plating the power supply lines comprises the steps of:

printing a negative mask on the thermoplastic resin film to define a region where the power supply lines are to be formed;

plating a power supply line layer on the negative mask including the region; and peeling off the negative mask to allow the power supply line layer to remain only at the region.

5. The method according to claim 1, wherein the thermoplastic resin film is selected from a group consisting of a polyethylene terephthalate resin film, a polycarbonate resin film, a tricarbonate resin film, a cellulose propionate resin film, and a cellulose acetate resin film.

6. The method according to claim 1, wherein the step of thermally shrinking the thermoplastic resin film is carried out at 100 °C for 4 hours.

7. The method according to claim 1, wherein the power supply lines are made of a copper-nickel alloy and have a thickness of 0.2 am.

8. The method according to claim 1, wherein the transparent coating is made of a polyethylene terephthalate resin or an acrylic resin.

9. Anti-frost goggles comprising power supply means for supplying a voltage of a desired level, a power switch for switching on and off the voltage supplied from the power supply means, and an electric line adapted to electrically connect the

power supply means and the power switch in series, further comprising:

heating elements arranged together in parallel on a body of the goggles while being uniformly spaced apart from one another by a desired distance;

a plurality of electrodes arranged in pair on a body of the goggles, the electrodes of each of the electrode pairs being electrically connected to opposite ends of an associated one of the heating elements, respectively;

power supply lines adapted to electrically connect the electrode pairs in parallel;

PTC thermistors each adapted to switch on and off the voltage applied to an associated one of the heating elements via the power supply lines, in accordance with a temperature of the associated heating element; and

terminals respectively soldered to portions of the goggle body, where respective ends of the power supply lines opposite to the electrodes are arranged, each of the terminals being electrically connected to an associated end of the electric line and an associated one of the ends of the power supply lines opposite to the electrodes.

10. The anti-frost goggles according to claim 6, wherein the anti-frost goggles is applied to one selected from a group consisting of goggles for snow mobiles, goggles for skiing,

goggles for skating, goggles for helmets, goggles for cars, goggles for airplanes, goggles for ships, glasses, and industrial goggles.

Fig. 1

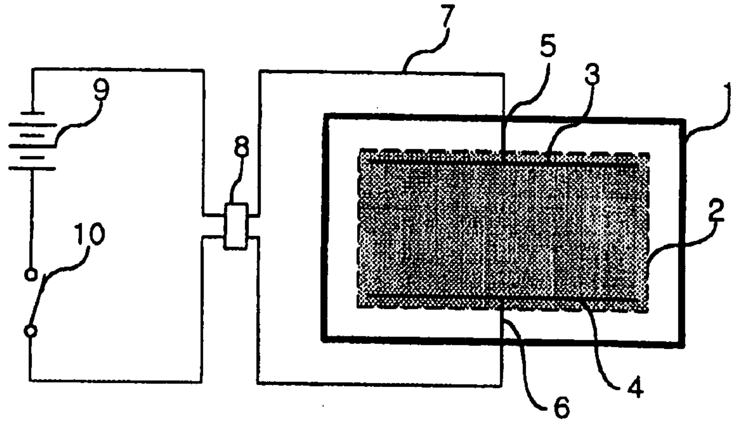


Fig. 2

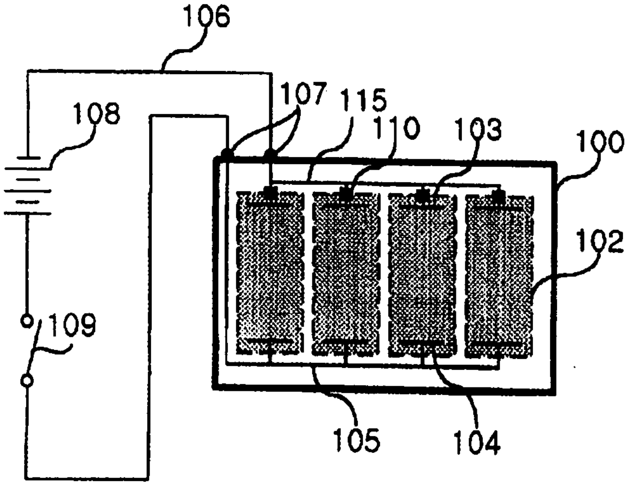
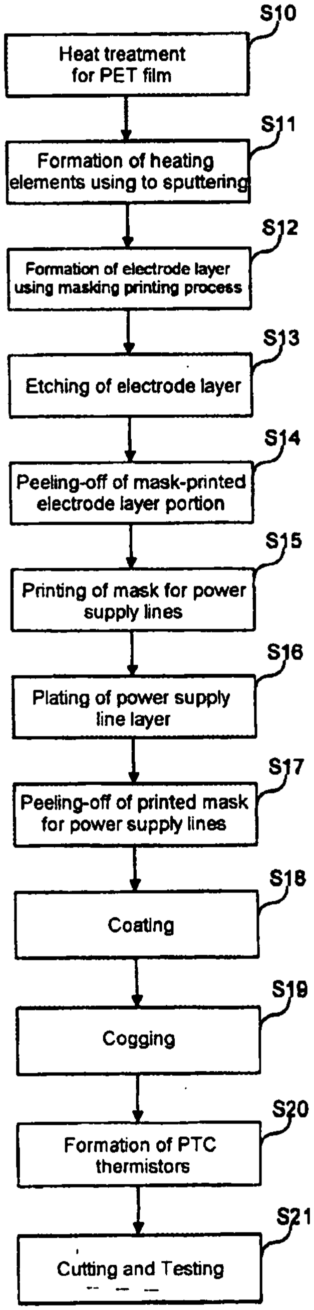


Fig. 3


S10
Heat treatment for PET film
S11
Formation of heating elements using to sputtering
S12
Formation of electrode layer using masking printing process
S13
Etching of electrode layer
S14
Peeling-off of mask-printed electrode layer portion
S15
Printing of mask for power supply lines
S16
Plating of power supply line layer
S17
Peeling-off of printed mask for power supply lines
S18
Coating
S19
Cogging
S20
Formation of PTC thermistors
S21
Cutting and Testing